ITCS 312: Automata and Formal Languages

Exam 1, First semester 2011/2012, Form: $\boxed{\text{A}}$

Name:

Student Number:

Section:

Section 1. (1 point each)

Mark the following statements with **True** if they are true and **False** otherwise.

Every regular language can be generated by regular expression.

Every NFA can be converted to an equivalent DFA.

The following grammar $S \to aaaS|Sbb|b$ represents the language $L = \{a^{3n}b^{2n+1} : n \geq 0\}$.

The language $L = \{w \in \{a, b\}^* : w$ has at least 3 a's and an even number of b's$\}$ is regular.

Nondeterminisim in finite automata is useless since every NFA can be represented by an equivalent DFA.

The regular expression $(aa)^* + (bb)^*$ generates the language $\{a^n b^m : n + m \text{ is even}\}$.

There exists a language L where $\overline{L^*} = (\overline{L})^*$.

Given an NFA that accepts a language L we can always find the NFA that accepts the language $\overline{L}$ by making every non-final state final and every final state non-final.

The language $L = \{w \in \{a, b\}^+ : |w| \mod 17 = 0\}$ can't be accepted by a DFA.

All finite languages are regular.

Section 2. (5 points each)

1. Consider the following language
$$L = \{a^n b^m : n + m \text{ is odd}\}.$$
Show that L is a regular language by finding a DFA for it.

2. Find a regular expression for the language

$$L = \{w \in \{0,1\}^* : \text{every 0 is followed by at most two 1's }\}.$$

3. (a) Construct an NFA for the language $L(b(b + (aa)^*)^*b)$.

(b) Write a set notation description of the language in (a).

4. Construct a regular expression for the following language:

$$L = \{a^n b^m : (n + m) \bmod 3 = 0\}.$$

5. Convert the following NFA to a DFA.